What is Claimed:

1. An optical device including at least one polarizing beam splitter having pass and rejection axes and at least one repolarizing reflector for converting a polarization of the incident beam between the pass and the rejection axes, the splitter and reflector being positioned so that the splitter encounters the beam at least twice, once along the pass axis and once along the rejection axis, and the repolarizing reflector is configured to perform an optical function on the incident beam in addition to reflecting and repolarizing it.

2. The device of claim 1 where the incident beam is polarized along one of the pass and rejection axes.

3. The device of claim 1 where the repolarizing reflector has a curved surface.

4. The device of claim 3 where the repolarizing reflector collimates the incident beam.

5. The device of claim 1 where the repolarizing reflector is configured so as to vary the intensity of the beam.

6. The device of claim 5 where the intensity of the beam is varied by varying its retardation in the repolarizing reflector.

7. The device of claim 1 where the device includes a further polarizing beam splitter having further pass and rejection axes oriented respectively along the rejection and pass axes of the one polarizing beam splitter.

8. The device of claim 7 where the further polarizing beam splitter encounters the beam at least twice, once along the further pass axis and once along the further rejection axis.

9. The device of claim 1 where the device includes a further repolarizing reflector in the path of the incident beam.

10. The device of claim 9 where the further repolarizing reflector performs a further optical function in addition to reflecting and repolarizing the beam.

11. The device of claim 10 where the further repolarizing reflector has a curved surface.

12. The device of claim 10 where the further repolarizing reflector varies the intensity of the beam.

13. The device of claim 1 further including a source of the incident beam.

14. The device of claim 13 further including a target for receiving the beam external to the device.

15. An optical device comprising:

a first polarizing beam splitter positioned to receive an incident beam,

a repolarizing reflector positioned to receive the beam from the first splitter, and being shaped so as to perform an optical function in addition to repolarizing and reflecting the beam;

a second polarizing beam splitter positioned at an angle to the first splitter to receive the reflected beam from the repolarizer, so as to increase the beam length of the incident beam within the device.

16. The device of claim 15 where the repolarizing reflector focuses the beam.

17. The device of claim 15 where the repolarizing reflector collimates the beam.

18. The device of claim 15 where the rpolarizing relector attenuates the beam.

19. The device of claim 15 further comprising an additional repolarizing reflector positioned at an angle with respect to the first and second splitters.

20. The device of claim 19 where the further repolarizing reflector performs a further optical function in addition to reflecting and repolarizing the beam.

21. The device of claim 15 further comprising:

an entrance face;

an exit face;

an additional element positioned one or both of the faces or performing an optical function on the beam.

22. The device of claim 21 where the additional element is a light valve.

23. The device of claim 21 where the addiotnal element is an attenuator.

24. The device of claim 23 where the attenuator is variable.

25. The device of claim 21 where the additional element is a lens.

26. The device of claim 21 where the exit face is parallel to the entrance face.

27. The device of claim 21 where the exit face is perpendicular to the exit face.

28. The device of claim 21 further comprising additional elements positioned at both of the faces.

29. The device of claim 28 where the optical elements perform different optical functions on the beam.

30. The device of claim 15 further comprising a source for the incident beam.

31. The device of claim 30 where the source includes an element for performing an optical function on the incident beam

32. The device of claim 30 further comprising a target for receiving the beam.

33. The device of claim 32 where the beam forms an image on the target.

34. A method for increasing the beam length of an incident beam in an optical device, comprising:

reflecting the incident beam from a first polarizing optical beam splitter;

passing the incident beam through a second polarizing beam splitter;

after having encountered both splitters, reflecting and repolarizing the beam while performing at least one further optical manipulation upon thereupon;

reflecting the repolarized beam from the second splitter;

passing the repolarized beam through the first splitter.

35. The method of claim 34 where manipulating the beam comprises collimating it.

36. The method of claim 34 where manipulating the beam comprises focusing it.

37. The method of claim 34 where manipulating the beam comprises varying its intensity.

38. An optical device comprising:

a first polarizing beam splitter having first pass and rejection axes, and positioned to receive an incident beam,

a second polarizing beam splitter having second pass and rejection axes aligned respectively with the first rejection and pass axes, and positioned at an acute angle to the first splitter;

a repolarizing reflector for interconverting a polarizationof the beam between the pass and rejection axes of the beam splitters, and positioned so that both beam splitters encounter the beam at least twice.

39. The device of claim 38 where the incident beam has a single polarization mode.

40. The device of claim 38 further comprising a source including a focusing element for the incident beam.

41. The device of claim 40 where the source further includes a folding mirror for reflecting the beam to the first beam splitter.

42. The device of claim 38 further including a projection screen positioned to receive the beam after it has encountered both of the beam splitters twice.

43. The device of claim 42 where the screen is positioned at the location of the second beam splitter.

44. The device of claim 38 where the repolarizing reflector is positioned non-diagonally with respect to at least one of the beam splitters.

45. A method for projecting an image, comprising:

transmitting an incident beam from a source through a pass axis of a first polarizing beam splitter;

reflecting the beam from a rejection axis of a second polarizing beam splitter positioned nonorthogonally with respect to the first beam splitter;

reflecting and repolarizing the beam;

reflecting the beam from a rejection axis of the first polarizing beam splitter;

transmitting the beam through a pass axis of the second polarizing beam splitter to a screen.

46. The method of claim 45 where the operations are performed in the sequence listed.

47. The method of claim 45 where the reflecting and repolarizing are performed at the same time.

48. The method of claim 45 where the pass and rejection axes of the first beam splitter correspond respectively to the rejection and pass axes of the first beam splitter.

49. The method of claim 45 where the first and second beam splitters are positioned at an acute angle to each other.

50. An optical device for increasing the beam length of an incident beam having a polarization mode, including a polarizing beam splitter having a pass and a rejection axis and a pair of repolarizing reflectors for converting the polarization of the incident beam between the pass and the rejection axes, the splitter and reflector being positioned so that the beam encounters the splitter at least three times.

51. The device of claim 50 where the beam encounters the splitter once along its pass axis and twice along its rejection axis.

52. The device of claim 50 where the polarization mode of the beam lies along the rejection axis of the splitter.

53. The device of claim 50 where the two repolarizing reflectors are positioned parallel to each other.

54. The device of claim 53 where the splitter is positioned diagonally to the repolarizing reflectors.

55. An optical device for increasing the beam length of a beam, comprising:

a first polarizing beam splitter having a first pass axis and a first rejection axis;

a second polarizing beam splitter having a second pass axis aligned with the first rejection axis and a second rejection axis aligned with the first pass axis;

a repolarizer for converting the polarization of the beam from one of the pass axes to a corresponding one of the rejection axes and vice versa;

a reflector adjacent the repolarizer for passing the beam to the repolarizer along an input path and for returning it to the repolarizer along the same path

the splitters and reflector being positioned so that the polarization of the beam is aligned with both of the pass axes and with both of the rejection axes within the device.

56. The device of claim 55 where the reflector is a retroreflector.

57. The device of claim 55 where the incident beam is polarized along the rejection axis of the first splitter.

58. The device of claim 55 further comprising a collimating lens.

59. The device of claim 58 further comprising a stop in the path of the incident beam.

60. An optical device comprising a plurality of cascaded units, each unit including at least one polarizing beam splitter having pass and rejection axes, at least one repolarizing reflector for converting a polarization of an incident beam between the pass and the rejection axes, and an element for manipulating the incident beam in addition to lengthening its path.

61. The device of claim 60 where each unit includes a second polarizing beam splitter having pass and rejection axes aligned with the rejection and pass axes of the first polarizing beam splitter.

62. The device of claim 60 where the element for manipulating the incident beam in at least one of the units is an attenuator.

63. The device of claim 62 where the attenuator is variable.

64. The device of claim 62 where the attenuator varies the repolarization amount of the incident beam in the repolarizing reflector.

65. The device of claim 60 where the polarizing beam splitter in each unit converts the polarization of only a portion of the incident beam of that unit.

66. The device of claim 65 where the beam portion is a band of wavelengths.

67. The device of claim 65 where the beam portion is different for different ones of the units.

68. A method of mixing different wavelength bands of a polarized beam, comprising, for a first of the wavelength bands:

transmitting an incident beam containing all the wavelength bands to a polarizing beam splitter having pass and rejection axes that are effective only over one of the wavelength bands, and that passes the other wavelength bands;

converting the polarization of the one wavelength band of the incident beam between the pass and rejection axes of the splitter and attenuating the one wavelength band;

forming an exit beam of the attenuated one wavelength band and the passed other wavelength bands;

iterating the above operations for each of the other wavelength bands, the incident beam of each iteration being the exit beam of the previous iteration.

69. The method of claim 68 where the wavelength bands are red, green, and blue.

70. The method of claim 68 further comprising again converting the polarization of the one wavelength band during each of the iterations.

71. The method of claim 70 further comprising again attenuating the one wavelength band during each of the iterations.

72. The method of claim 68 where the converting and repolarizing operations occur at the same time.

73. The method of claim 72 where attenuating the one wavelength band comprises converting its repolarization by a variable amount.

74. An optical device for increasing the length of an optical beam having a given polarization mode, comprising:

a first polarizing beam splitter fabricated of a material having intrinsic first pass and rejection axes;

a second polarizing beam splitter fabricated of a material having intrinsic second pass and rejection axes respectively aligned with the first rejection and pass axes;

a repolarizing reflector for converting the polarization mode of the beam from one of the pass axes to a corresponding one of the rejection axes and vice versa,

the splitters and reflector being positioned so that the polarization of the beam is aligned with both of the pass axes and with both of the rejection axes within the device.

75. The device of claim 74 comprising only a single repolarizing reflector, the repolarizing reflector being positioned diagonally with respect to both of the splitters.

76. The device of claim 74 where the repolarizing reflector comprises a reflector and a phase retarder in contact with each other.

77. The device of claim 76 where the reflector is a first-surface reflector.

78. The device of claim 76 where the reflector is a second-surface reflector.

79. The device of claim 76 where the phase retarder retards both an incident and a reflected beam by one-quarter wavelength.

80. The device of claim 74 where the polarizing beam splitters are perpendicular with respect to each other.

81. The device of claim 74 where each of the polarizing beam splitters has a transparent substrate having opposite sides and a polarizing beam splitting layer on each of the opposite sides.

82. The device of claim 81 where the polarizing beam splitting layers have pass and rejection axes aligned with each other.

83. The device of claim 74 where at least one of the polarizing beam splitters is non-planar.

84. The device of claim 74 where the device is filled with a solid transparent material.

85. The device of claim 74 where the device is hollow.

86. A method for fabricating a polarizing beam splitter, comprising:

heating a flexible film having intrinsic pass and rejection axes;

placing the heated film under tension to reduce the size of ripples therein;

cooling the film under tension to maintain the ripples at the reduced size.

87. The method of claim 86 where the film is placed under tension only in one direction.

88. The method of claim 86 where the film is placed under tension in both directions.

89. The method of claim 86 where the film is placed under tension by stretching it in a frame.

90. The method of claim 86 further comprising curving the film.

91. The method of claim 90 where the film is curved by holding the film in a frame and applying air pressure to the film.

92. The method of claim 86 where the film is stretched on a substrate.

93. The method of claim 92 where the substrate is curved.

94. The method of claim 86 where the tensioned film is laminated to a substrate with an adhesive.

95. The method of claim 94 where the tensioned film is laminated on both of its sides.

96. The method of claim 86 where a substrate material fills a cavity adjacent one side of the tensioned film.

97. The method of claim 96 where the substrate material fills a further cavity adjacent the other side of the tensioned film.